Welder’s Safety and Health Guide

INTRODUCTION

Welding often involves a variety of physical and chemical hazards. These hazards are varied and dependant on the type of welding process, and the quantity and type of materials used. These hazards include specific base and filler metals, fluxes, shielding gases and primers.

SAFETY GUIDELINES

Protect workers from welding fumes and gases. Exhaust ventilation may be necessary, especially when welding with particularly hazardous materials, large volumes of materials, or when welding for long periods of time. Proper ventilation is essential in enclosed or confined spaces. Welding tables equipped with slot exhausts, portable welding exhaust ventilation systems including moveable elephant trunk exhaust, and small diameter welding gun mounted fume extractors are commercially available. Air-purifying respirators can filter out metal fumes, they do not protect workers from all of the hazardous gases produced or oxygen deficiency.

Proper cleaning and removal of primers, paints, cleaners and surface coatings from welding surfaces will reduce exposures.

Consider orientation of materials and body position of the welder when laying out the job and conducting the work, allowing the welder to avoid the natural heat rise of the fumes when possible. Exposures can be significantly reduced if welders are not positioned directly over fumes.

Only operate welding equipment you have been trained to use. Know what the substance is that is being welded and any coating on it.

Make sure a fire extinguisher is near for immediate use. Check area before welding to be sure no flammable material or degreasing solvents are near the welding area.

Wear protective clothing to cover all exposed areas of the body (closely woven clothing, long socks, gloves), leak proof welder’s helmet. If goggles are worn, be sure the tint is corrected to protect from ultraviolet and infrared radiation.

If others are working in the area, be sure they are warned of and protected against arc, fumes, sparks, and other welding hazards.

Use spark catchers when working at elevated levels.

Always make sure there is good local exhaust ventilation. Always avoid inhaling fumes of any kind. A NIOSH approved respirator and local exhaust ventilation should be used in all confined areas.

Deposit all scraps and electrode butts in proper waste container to avoid fire and toxic fumes.

Check welding area when job is completed to be sure there are no smoldering materials, hot slag, or live sparks.

Closed containers that have held flammables or combustibles must be properly cleaned or purged before work is started.

Use a fire watchman when welding or cutting on walls, bulkheads, and through doors or other similar situations where you cannot see dangers ahead. First be certain there are no flammable solids, liquids, gases, or vapors behind the bulkhead on which you weld.

Check area for degreasing equipment. No welding should be done within 200 feet of degreasing solvents because deadly phosgene gas is produced by welding near degreasing solvents.

ELECTRIC ARC

Be sure electrode is clear of the conductor before starting work.

Be sure all connections or leads are in place; leads should be installed.

Keep yourself insulated from ground or metal when changing electrodes.

Shut off machine when leaving work; disconnect at the power source.

Never look at a flash even for an instant. Be sure to turn your head completely away from the arc and be careful of reflections. Your eyes can be severely damaged by the infrared rays.

ACETYLENE

Oxygen under pressure reacts violently.

If there is a leak in an oxygen or gas cylinder take it outside and slowly release gas.

Close the cylinder valve as soon as work is finished, or when taking a break for any period of time.

When cylinders are emptied, close the valve, replace the protective cap and mark the cylinder “MT.”

The valve on the acetylene cylinder should never be opened more than one and one-half turns.

Make sure gas systems have check valves to prevent back flow into the fittings and that couplings are secure.

HIGH VOLTAGE

ELECTRODES

Source: Live electrode

Effect: Burns, shocks, electrocution

Control: Cover electrodes, keep splices in safe condition; no welding in wet conditions

FUMES

Control: Local exhaust ventilation; wear an approved NIOSH respirator if in confined area. **See a physician if overexposure to welding fumes is suspected**

Antimony

Source: Antimony-lead solder

Effect: Irritates skin and eyes; headache and vomiting

Brass

Source: Welding; lead and copper alloy

Effect: Dermatitis; metal fume fever; see also copper and lead effects

Cadmium

Source: Paint, some silver solders, filler materials for welding

Effect: Irritates skin and mucous membranes; gastroenteritis (stomach pain), lung irritation, chest pain, bronchitis, fluid in lungs, chills with fever

Chromium

Source: Adhesives, cement, paint, metal coating, stainless steels

Effect: Bronchitis, skin ulcers, nose, and nasal passage irritant

Copper

Source: Cutting, soldering of copper pipe

Effect: Irritates nose and throat; metal fume fever

Cobalt

Source: Welding fumes and grinding dusts

Effect: Irritates skin; can damage lungs, heart, liver, kidney; metal fume fever

Iron

Source: Welding on iron or steel, scraping iron or steel

Effect: Metal fume fever

Lead

Source: Pipe joints, paints, demolition, remodeling

Effect: Abdominal pain, headache, muscular aches, weakness, central nervous system and kidney damage, anemia, effects on bone marrow; metal fume fever, impotency

Magnesium

Source: Welding fumes and grinding dust

Effect: Metal fume fever

Manganese

Source: Welding electrodes

Effect: Increased levels of manganese in blood and urine; chronic manganese poisoning; headache, apathy, sexual impotence, speech disturbances, slowed reflexes, effects on central nervous system

Nickel

Source: Welding fumes and grinding dust

Effect: Human carcinogen, nickel allergy dermatitis

Tin

Source: Welding fumes and grinding dust

Effect: Metal fume fever

Zinc

Source: Soldering or welding zinc coated or galvanized metal; paint pigment

Effect: Irritation of respiratory tract, dryness of throat, dry coughs, malaise, headache, nausea, severe chills with fever, pains in limbs, shaking in limbs, sweating, metal fume fever

VAPORS

Source: Degreaser solvents; ultraviolet rays in welding can decompose degreasing solvents forming highly toxic gases

Effect: Phosgene is a highly toxic gas which can cause death. Initial effects are irritation to skin, eyes, nose, throat, and chest; dizziness and chills. Delayed effects: 2 to 24 hours after exposure, outpouring of fluid into air sacs of lungs. **Can be fatal**

Control: Good ventilation; protective clothing; **do not weld near degreasing operations as toxic gases can be formed when degreasing solvents are exposed to strong ultraviolet light from welding**

GASES

NOTE: When welding in any confined area a respirator should always be used.

Acetylene

Source: Gas used in oxyacetylene welding

Effect: Rapid breathing, loss of coordination; high concentration can cause suffocation

Control: Good local exhaust ventilation

Arsine

Source: Possible contamination of commercial acetylene

Effect: Anemia (breakdown of red blood cells), jaundice, pulmonary edema, irritates eyes, nose, skin, lungs

Control: Good local exhaust ventilation

Carbon Dioxide

Source: Welding by product

Effect: Headache, dizziness, nausea, vomiting; in high concentrations symptoms of suffocation, eventual unconsciousness and eventual suffocation

Control: Good local exhaust ventilation

Carbonic Acid

Source: In a damp atmosphere carbon dioxide combines with water vapor

Effect: Irritates eyes, skin and mucous membranes Control: Good general ventilation and dry work conditions

Nitrogen Dioxide

Source: Welding by product

Effect: Irritates nose, throat, lungs; causes headache, chest pain, drowsiness, hemorrhage, fluid in lungs, lung damage

Control: Good general ventilation (if air smells sweet like electrical storm, stop work immediately and get fresh air)

Ozone

Source: Welding by product

Effect: Irritates nose, throat and eyes; coughing, chest pain, headache, shortness of breath, pulmonary edema

Control: Good general ventilation of welding area (if air smells sweet like electrical storm, stop work immediately and get fresh air)

Phosgene

Source: Welding by product; produced when ultraviolet rays given off by welding decompose degreasing chemicals

Effects: Highly toxic, can cause death. Initial effects are irritation to skin, eyes, nose, throat and chest; dizziness chills, thirst; delayed effects: 2 to 24 hours after exposure the outpouring of fluid into air sacs of lungs can be fatal

Control: No welding should be done within 200 feet of degreasing operations; if gas is smelled, evacuate area immediately

Phosphine

Source: Possible contaminant of commercial acetylene

Effects: Fatigue, tremors, coma, convulsions, pulmonary edema; long term exposure can cause anemia and stomach problems

Control: Good local exhaust ventilation

RADIATION, NON-IONIZING

Ultraviolet

Source: Arc or its reflection

Effect: Irritates and damages eye tissue; can cause painful sunburn and possibly skin cancer

Control: Proper eye protection; clothing covering all parts of the body; separate welders from all other workers

Infrared

Source: Heat waves given off by all bodies that radiate heat

Effect: Can cause damage to parts of the eye; workers may develop a condition called “heat cataract”

Control: Regular clothing; goggles to protect eyes

METALLIC SPARKS/MOLTEN METAL

Sparks

Source: Heated metal, hot metal Effect: Burns, fires

Control: Eye protection; protective clothing including long pants, sleeves, and socks; gloves